

Remarks

The Examiner is thanked for the courtesy of the telephonic interview extended to Applicants' undersigned representative on February 2, 2006. During that interview the undersigned explained Applicants' view of the claim scope and the disclosures contained in the Rodbell and Ting references used to reject the pending claims. Specific points were made with respect (1) Ting's disclosure failing to two different wet processes in a single tool, (2) Rodbell's disclosure failing to suggest any wet processing beyond electroplating, and (3) an amendment reciting an additional operation involving wet etching. The Examiner agreed to consider these points when presented in a written response.

Claims 28-38 and 39-41 are pending in this application. All claims were rejected in the current Office Action. Claims 28, 30-32, and 35-41 were rejected under 35 USC 103 as unpatentable over the combination of US Patent No. 6,344,129 to Rodbell et al. (Rodbell) and US Patent No. 6,017,820 to Ting et al. (Ting). Claim 29 was rejected over the combination of Rodbell and Ting as above and further in view of US Patent No. 6,179,982 to Ting et al. Finally, claims 33-34 were rejected over the combination of Rodbell and Ting as above and further in view of US Patent No. 6,893,550 to Dubin et al.

In the present response, claims 28, 40, and 41 have been amended. Claim 39 has been cancelled without prejudice. Support for the amendments to claims 28 and 41 is found at page 5, lines 8 to 30 and page 20, lines 2-7, for example. Support for the amendment to claim 40 is found at page 5, lines 15-18, for example.

The amended claims contain new combinations of limitations that are not suggested in the cited art. For example, the combinations of processing by electrofill and electromechanically polishing or electroplanarizing, together with wet etching, all in a single module or cluster tool, is not suggested in the prior art.

Over the course of prosecution, the claims have become more focused on some of Applicant's preferred embodiments. Some current claims recite

- (a) providing the wafer to an electrofill station in a module or cluster tool;
- (b) in the electrofill station, electroplating copper on the wafer . . . ;
- (c) transferring the wafer to a second station in said module or cluster tool;
- (d) in the second station, at least partially electromechanically polishing or electroplanarizing the wafer;

- (e) transferring the wafer to another station in said module or cluster tool; and
- (f) in this other station, wet etching the wafer.

An advantage of this method, which is implemented in a single module or cluster tool, is that electrochemical deposition and subsequent material removal can take place with minimal chemical-mechanical polishing (CMP), which is a relatively expensive process. The use of wet etching in particular minimizes the need for CMP.

As mentioned, a process or tool making use of electroplating, electromechanically polishing or electroplanarizing, and wet etching in separate stations is not suggested in the cited art. As the Examiner points out, Rodbell describes a two-stage electrodeposition process in which high aspect ratio features are filled in a first stage and low aspect ratio features are filled in a second stage. It is not clear whether Rodbell contemplated performing the two stages in separate stations within the same module or tool. Regardless, Rodbell does not describe a separate material removal step performed in the same tool or module and certainly does not hint that material removal could be accomplished via electromechanically polishing, electroplanarizing or wet etching.

Ting describes an interface "designed to allow cluster tools to be completely isolated from one another when two different environments are utilized." Column 3, lines 33-37. For example, the interface may be employed to connect one cluster tool operating under vacuum (e.g., a tool responsible for sputtering or CVD processes) and a different cluster tool operating at atmospheric pressure (e.g., a tool responsible for plating). While Ting mentions certain processes recited in the claims (e.g., electroplating, electropolishing, and etching) it merely identifies these as examples of alternatives to low-pressure processes such as sputtering. Ting does not suggest that a single cluster tool or even two different cluster tools connected by the Ting interface would include separate stations for each of electroplating and electropolishing. Ting's examples involve a vacuum deposition cluster tool connected (by the Ting interface) to a plating cluster tool (see column 3, lines 37 to 41 and column 6, lines 24-35). Given Ting's interest in providing interfaces between processes requiring *different* environments, it is not surprising that Ting does not suggest combining electroplating, electropolishing, and/or wet etching, as each of these is typically performed in the *same* basic environment: an atmospheric pressure environment.

Because neither Ting nor Rodbell suggests combining electroplating, polishing or planarizing, and wet etching in a module or tool as claimed, it is respectfully submitted that independent claim 28 is patentable over these references. Independent claim 41, as well as dependent claims 29-38 and 40-41 are also patentable over these references for similar reasons. The other references cited to reject the dependent claims (Dubin et al. and Ting '982) do not

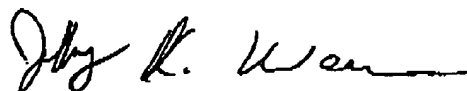
suggest this combination of operations as claimed, and therefore fail to overcome the deficiencies of the Rodbell and Ting combination. Withdrawal of all pending art rejections is respectfully requested.

Conclusion

In light of the foregoing amendments and remarks, Applicants respectfully submit that all pending claims are now in condition for allowance. Thus, Applicants respectfully request a Notice of Allowance from the Examiner. Should any unresolved issues remain, the Examiner is encouraged to contact the undersigned at the telephone number provided below. No fees appear to be necessary for this Amendment. However, if the Commissioner determines that any fee is due, such fee may be charged to deposit account No. 50-0388 (Order No. NOVLP016C1).

Respectfully submitted,

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